

Application No. 10/628,842
Response dated October 14, 2005
Reply to Office Action of June 16, 2005

REMARKS

This is in response to the office action dated June 16, 2005. There are presently claims 1 through 10 in prosecution, while claims 11 through 19 have been withdrawn. New dependent claim 20, which depends from independent claim 1, is being submitted with this response. Applicant is submitting this response in order to place the claims in prosecution in condition for allowance.

The Examiner rejected claims 1 and 7 under 35 USC 112 as being indefinite. Claims 1 and 7 have been amended to avoid the Section 112 rejection. The present invention is capable of producing materials with a selectivity of greater than 95%. The nature of the process favors very high selectivity rates that will approach 100%, and 100% selectivity is theoretically possible. More commonly, selectivity will approximate 98%, 99%, or 99.9%. Traditional production methods are generally limited to selectivity values of 90%. Applicant submits that the amended claims 1 and 7 are now in allowable condition.

Furthermore, the Examiner rejected claims 1 and claims 3-6 based on the Coll et al. patent (U.S. Patent 6,596,187. Coll teaches the preparation of carbon nanotubes using supported catalysts, whereas the present invention utilizes unsupported catalysts for the preparation of carbon nano-fibers. That being the case, claims 1 and 7 were amended to specify that the catalyst is unsupported.

This amendment to independent claims 1 and 7, applicant would assert, renders the arguments of the Examiner as moot. The Examiner mistakenly compares the surface areas of the supported catalysts taught by Coll to the unsupported catalysts of the present invention. While Coll does not specifically mention the surface area of the underlying support, it is expected that a support of the type described by Coll would contribute significantly to the total surface area of the catalyst. The active catalyst itself will thus have a surface area significantly lower than the 80-100 m²/g described by Coll. In the present invention, the catalysts are not supported and the referenced surface areas describe the catalytically active material, not diminished by the presence of an underlying support.

The Examiner then discusses the selectivity of the Coll process. Claims 29 and 30 of the Coll

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patent use the language, "at least one nanotube is single-walled nanotube" and "at least one nanotube is multi-walled nanotube" respectively. The presence of at least one nanotube of a specific morphology does not refer to the selectivity of the process. Starting at column 6, line 63, Coll described the substantially uniform structure produced materials, and subsequently at column 7, line 2, describes the aspect ratio of materials. It is applicant's contention that the Examiner is mistakenly using the uniformity of internal structure for Coll's materials to refer to selectivity.

In the present invention, selectivity is defined as the "fraction of the carbonaceous product possessing the intended morphology (orientation of graphene layers)". Applicant's conventional use of the term refers to the bulk fraction of materials produced, not the uniformity of internal microstructure within a given nanotube. Nothing in the Coll patent describes a high degree of selectivity with respect to bulk fractions of specific materials produced.

The Examiner next appears to make an inherency argument regarding purity and yield of the Coll process. Coll does not teach or describe the purity and yield of the claimed process. Based on literature, personal experience, and limited data generated at applicant's company, a similar process utilizing a supported catalyst (such as that in Coll) would be limited to a maximum purity of approximately 40% and a maximum yield of approximately 30%. I should stress that these values are not specific to the Coll process and no attempt has been made to reproduce the Coll process. These values are typical for a process using a supported catalyst.

Finally, the Examiner refers to amorphous carbon film material as an impurity. While applicant cannot speak for materials produced in the Coll process, the materials produced using the present invention do not contain any amorphous carbon film. Applicant's company has extensive experience in the characterization and analysis of nano-carbon materials. Its analytical capabilities include x-ray diffraction and scanning transmission electron microscopes. These materials have been extensively characterized and no such amorphous materials have been found. This is further reflected in the high selectivity of the process of the present invention.

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The Examiner uses virtually identical arguments with the Someya application as he did with the Coll patent. We have not provided the same level of detail for these arguments as we believe that the arguments above should be sufficient to overcome the rejections in total. Someya utilizes a sol-gel carrier and template to produce materials. The catalyst particles described in Someya will be controlled by the pores and the template itself. The surface area of the catalyst particles will be dependent on that of the support, which itself provides a substantial portion of the total surface area (see Surface Area arguments above).

In general, the present invention describes the process of producing carbon nano-fiber materials using unsupported catalysts. No other process is currently known which can achieve the high degree of yield, purity, and selectivity. No unsupported catalyst materials exist in the size and surface area range as those of the present invention. It appears that the obviousness rejections are based in the confusion between the present invention and those in Coll and Someya.

Applicant respectfully submits that the application is in condition for allowance. A Notice of Allowance is hereby respectfully requested.

Should the Examiner feel that a telephone conference would advance the prosecution of this application, he is encouraged to contact the undersigned at the telephone number listed below.

Applicant respectfully petitions the Commissioner for any extension of time necessary to render this paper timely.

Application No. 10/628,842
Response dated October 14, 2005
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Please charge any additional fees due or credit any overpayment to Deposit Account No. 50-0694.

Respectfully submitted,

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Application No. 10/628,842
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I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: MAIL STOP AMENDMENT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 14 day of October, 2005.

Alison Bowles
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